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ABSTRACT

A method and device for using laser light to trap non-atomic size particles optically within a hollow region of a hollow core optical fiber are disclosed. Also described are a method and device for flexibly transporting the trapped particles along the fiber over long distances. The present invention allows to manipulate and guide particles made of a wide variety of materials, including biological tissue and aerosols, along the optical fibers and deposit the materials on various substrates. The laser guiding device comprises a laser beam source generating a laser beam, which is directed to an entrance of a hollow core optical fiber by a focusing lens. A source of the particles to be guided through the fiber provides a certain number of particles near the entrance to the fiber. The particles are then drawn into the hollow core of the fiber by the focused laser beam, propagating along a grazing incidence path inside the fiber. Laser induced optical forces generated by scattering, absorption and refraction of the laser light by a particle traps the particle close to the center of the fiber and propels it along. Any micron-size material, including solid dielectric, semiconductor and solid particles as well as liquid solvent droplets, can be trapped in laser beams and transported along optical fibers due to the net effect of exertion of these optical forces. After traveling through the length of the fiber, the particles can be either deposited on a desired substrate or into an analytical chamber, or dealt with depending on the goal of a particular application.

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